

## **U.S Integrated Earth Observation System**

### **Air Quality Assessment and Forecast System**

#### **Preamble**

The USGEO is coordinating the activities to formulate integration framework documents for the six near-term opportunity areas identified in the Strategic Plan for the U.S. Integrated Earth Observation System.

One of the steps is to take inventory of the Earth observation systems, models, and decision support systems that exist or are planned to be developed over the coming years. The following tables are initial compilations of U.S. capabilities in Earth observation systems, models and decision support systems. Earth observation systems, models, and decision support systems identified in the tables are candidates for inclusion in Integrated Earth Observation System configurations for each of the near term opportunity areas.

These tables are draft and as such, are neither exclusive nor comprehensive. We invite interested members of the community to provide input to the content of these tables and system configurations – both during the sessions on the second day of the IEOS Public Engagement Workshop and through email submissions to the USGEO. Your review and input to these tables and to the Integrated Earth Observation System configurations for each of the near term opportunities is greatly valued and appreciated.

#### **Draft Table 1. Products, Services, Observing Systems and Models**

<b>Products/Services</b>	<b>Observing System/Model</b>	<b>Instrument/Parameter</b>	<b>Agency</b>
<b>Surface Observations</b>			
Nationwide surface in-situ data for surface National Ambient Air Quality Standards.	State and Local Air Monitoring Stations (SLAMS)/National Air Monitoring Stations (NAMS).	Surface Ozone, Nitrogen Oxides, Carbon Monoxide, Sulfur Dioxide, Suspended fine particulate matter (PM-2.5) and the mass of coarse particulate matter (PM-10)	EPA and US State and Local Air Agencies
	National Park Service Gaseous Pollutant Monitoring Network.	Ozone, Nitrogen Oxides, Carbon Monoxide, Sulfur Dioxide, suspended	NPS

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Products/Services	Observing System/Model	Instrument/Parameter	Agency
		fine particulate matter (PM-2.5) and the mass of coarse particulate matter (PM-10).	EPA
	Photochemical Assessment Monitoring Stations (PAMS)	Ozone, Nitrogen Oxides, volatile organic compounds, formaldehyde, acetaldehyde, acetone	
Nationwide data of rural sites for dry and wet deposition.	Clean Air Status and Trends Network (CASTNet)	Wet and dry deposition measurements	EPA
Nationwide data to quantify emissions changes effects on air quality and deposition.	Atmospheric Integrated Research Monitoring Network (AIRMon)	Wet and dry deposition measurements	NOAA
Cooperative network for assessing nationwide trends for acid deposition.	National Acid Deposition Program and National Trends Network (NADP/NTN)	Wet and dry deposition measurements	Various State, Federal and Local agencies, universities, and private companies.
Surface in-situ data for visibility monitoring representative of all visibility-protected Class I areas.	Interagency Monitoring of Protected Visual Environments (IMPROVE)	Mass and chemical composition of the suspended fine particulate matter (PM-2.5) and the mass of coarse particulate matter (PM-10). Optical properties transmissometers, nephelometers	NPS, EPA, USFS, FWS, BLM, and NOAA
Regional AQ Forecast Models			
Northeast US 1 day air quality forecast	Eta12-CMAQ Community Multi-scale Air Quality model	Predicted air quality ground level 1-hr and 8-hr average O3 levels	NOAA/EPA
	MM5-CMAQ (Mesoscale Meteorological Model and Community Multi-scale Air Quality Model		PSU/EPA
Air parcel trajectory model.	Hysplit (Hybrid Single-Particle Lagrangian Integrated Trajectory) Model		NOAA
	WRF-CHEM (Weather Research Forecast – Chemistry) Model		NOAA
Global Forecast Models			
Atmospheric Data Assimilation	GFS (Global Forecast System Model)	3-D atmospheric fields	NOAA
Chemical Transport Model - Ozone Assimilation/Prediction	RAQMS (Regional Air Quality Modeling System	3-D atmospheric fields	NASA

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Products/Services	Observing System/Model	Instrument/Parameter	Agency
Atmospheric Data Assimilation	GEOS-Chem/Fv-GDAS	3-D atmospheric fields	Havard/NASA
Chemical transport model	MOZART (Model of Ozone and Related Tracers)	3-D atmospheric fields	NOAA
Chemical transport model –Ozone/Aerosol Prediction	GOCART (Georgia Tech/Goddard Global Ozone Chemistry Aerosol Radiation Transport) Model	3-D atmospheric fields	GATech/NASA
Spaceborne Platforms			
Trace gases and aerosol, temperature, winds, clouds, land cover, thermal anomaly	EOS-Terra	MOPITT, MODIS, MISR	NASA
Trace gases and aerosol, temperature, winds, clouds, land cover, thermal anomaly	EOS-Aqua	AIRS, MODIS	
Trace gases and aerosols, temperature, winds, clouds, UVB	EOS-Aura	TES, MLS, OMI, HIRDLS	
Normalized Difference Vegetation Health Index	POES/NPOESS (National Polar-Orbiting Operational Environmental Satellite System)	AVHRR	NOAA
Cloud Mask			
Snow Cover			
Global Land Cover Characterization			
Atmospheric Temp		AMSU	
Precipitation			
Sea Surface Winds		Conical Microwave Imager/Sounder	
Soil Moisture			
Precipitable Water			
Snow Cover / Snow Depth			
Surface Wind Stress			
Operational Clear-Sky VIS Composite	GOES 8-12	GOES Imager	
Operational Surface Albedo			
Operational Surface Insolation			
Water Vapor Transport			
Operational Skin Temperature Operational Total Precipitable Water Atmospheric Temperature	GOES 8-12	GOES Sounder	
Air quality, trace gases, ozone, aerosols, water vapor, others	MODIS-Terra, -Aqua, TOMS, Aura, Aeronet, AIRNow, AIRS, INTEx, CALIPSO, POES, NPOES,	Aerosols, ozone and precursors, trace gases measures and monitoring, models	EPA, NOAA, NASA, NPS

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Products/Services	Observing System/Model	Instrument/Parameter	Agency
	OAR-Dobson, OAR-AERO, Air Data: Access to Air Pollution Data - Ambient Monitoring Systems, EPA- FERA Fate, Risk, and Exposure models for criteria and toxic pollutants, -TribalAIR tribal nations air quality, - New Source Review, DOE- MiniCAM		
Aerosol transport	GOCART	Model	
Emissions inventories	MODIS-Terra, -Aqua, MOPITT, EPA Air Facility System (AFS), EPA Clean Air Markets - Data and Maps, Electricity Sector Emissions, EPA- Biogenic Emissions Inventory System (BEIS), - C-MAP: Clean Air Mapping and Analysis Program	Emissions, inventories, models, databases, maps	
UV monitoring	TOMS, EPA & NOAA/NWS -UV Index, EPA-NPS- SunWise	Monitoring and models	
Atmospheric Chemistry	GEOS-CHEM, EPA SCRAM Support Center for Regulatory Air Models	Models	
Air trajectories and more	NOAA-ARL-HYSPLIT	Models	
Haze and regional visibility	MODIS-Terra, -Aqua, EP- TOMS, OMI, HRDLS, GEOS-CHEM, MM5, RAQMS, GOCART, EPA- NPS IMPROVE - Interagency Monitoring of Protected Visual Environments, -IMPROVE Network	Monitoring and models	
Particulate matter	EPA-NAMS and SLAMS network	Monitoring and models	
Indoor Air Quality	EPA-National Ambient Air	Monitoring and	

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Products/Services	Observing System/Model	Instrument/Parameter	Agency
	Quality Standards (NAAQS)	models	
Deposition	EPA-CASTNET, RADN, OAR-AIRMoN, National Atmospheric Deposition Program – NADP, acid rain	Monitoring and models	
Related model Databases	EPA -Center for Exposure Assessment Modeling (CEAM) - Models knowledge database, EPA-CREM, Council on Regulatory Modeling database of models	Monitoring and models	
Mercury	EPA Mercury		
Cloud properties and profiles	MODIS-Terra, -Aqua, CloudSat, CALIPSO, NPP, NPOES	Monitoring and models	
Cloud Properties	ARM - Lidar, Ceilometers, Sky Imagers, Cloud radars,	Aerosol scattering, cloud boundaries, reflectivity, water vapor, liquid water path etc.	
Surface radiation	OAR-ARL-SURFRAD	Monitoring	
Boundary layers and conditions	EPA & NOAA-CMAQ	Monitoring and models	
Meteorology and more	MM5 community model, ETA	Models	
Fires and smoke	NOAA-USFS-EPA BlueSkyRAINS, MODIS, SMOKE	Smoke monitoring, models, trajectories	
Mobile source emissions	MEASURE, EPA-Mobile Source Observation Database (MSOD), EPA-Mobile6 Vehicle Emission Modeling Software, - NONROAD Model (Nonroad engines, equipment, & vehicles), - MOVES (Motor Vehicle Emission Simulator), DOT-Assessments and Modeling COMMUTER Model	Monitoring and models	
Precipitation	NWS-COOP	8-inch, Heated Tipping, Fisher Porter, Belfort Rain Gauge, Geonor	

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Products/Services	Observing System/Model	Instrument/Parameter	Agency
Humidity	NESDIS-CRN, NWS-ASOS	Vaisala Capacitance	
Winds	OAR-ENSO-Drifting Buoys, OAR-TAO-PIRATA, OAR-TAO-TRITON	Wind Speed/Direction	
Surface Air Temperature		MMTS, Platinum Resistance Thermistor	
Radar-derived Wind Direction	NWS-NEXRAD Radial Velocity	Radial Velocity	
Dioxin	EPA-National Dioxin Air Monitoring Network (NDAMN)	Monitoring	
Evaporation	NWS-COOP	Pans	
Emissions inventories	NEISGEI - Networked Environmental Information System for Global Emissions Inventories, EPA-National Emission Inventory (NEI) Database for Criteria & Hazardous Air Pollutants, - Air Trends, - AirControlNET, relational database tool for conducting control strategy and costing analysis	Inventories, models, reports	
Land cover and use, terrestrial measures	NSF-Global Grid, USGS-NBII	Shared terrestrial data and models	
Land characteristics and heat flux			
Land Surface Wind Speed	NESDIS-CRN NWS-NERON,	Anemometer	
Land Surface Wind Direction	NWS-NERON, NWS-ASOS, NOS-PORTS, OAR-ARL-SURFRAD, OAR-FRD Mesonet	Anemometer	
			NOAA, NASA, EPA-Model
Standardized Precipitation Index	SPI Model	Drought Severity Measure	
Evaporation, Soil Moisture	CPC One-Layer Hydrological Model (Leaky)	Soil Conditions	
Seasonal Forecasts	Climate Forecast System Model (CFS) OCN, CCA, MLR		
6-10, 8-14 Day Forecasts	Global Forecast System		

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Products/Services	Observing System/Model	Instrument/Parameter	Agency
	Model (GFS)		
Short-term Forecasts	N.A. Mesoscale Model (NAM), Rapid Update Cycle Surface Assimilation System (RSAS)		
Atmospheric Data Assimilation	Global: CDAS, GDAS/GFS, Regional: NARR/Eta-Noah	3-D atmospheric fields	
Atmospheric Parameters	GOES, POES, GIFTS, NPP, NPOES		
Precipitation Analysis	CMAP/GPI,OPI,SSM/I, MSU/GFS CMORPH/AMSU-B, SSM/I, TMI, AMSR/E	Merged analysis precipitation data	
Land Data Assimilation	LDAS/Noah, VIC, Mosaic, Sacramento/GOES, Doppler radar, gage	Soil, snow, surface characteristics	NOAA/NASA-Model
Landscape Characterization	GMAO Ocean	North American Char.,Terra, Aqua, Landsat, NPOES	
Land cover data	GSFC GOCART	National Land Cover	
National Land Cover Data	Landsat 5/7	Thematic Mapper/Enhanced TM	EPA, NASA, USGS-Spaceborne
Normalized Diff Veg Health Index	POES/NPOESS (National Polar-Orbiting Operational Environmental Satellite System)	AVHRR	NOAA-Spaceborne
Cloud Mask			
Snow Cover			
Global Land Cover Characterization			
Atmospheric Temp		AMSU	
Precipitation			
Sea Surface Winds		Conical Microwave Imager/Sounder	
Soil Moisture			
Precipitable Water			
Snow Cover / Snow Depth			
Surface Wind Stress			
Operational Clear-Sky VIS Composite	GOES 8-12	GOES Imager	
Operational Surface Albedo			
Operational Surface Insolation			
Water Vapor Transport			
Operational Skin Temperature Operational Total	GOES 8-12	GOES Sounder	

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Products/Services	Observing System/Model	Instrument/Parameter	Agency
Precipitable Water Atmospheric Temperature			
Surface Water Supply Index	SWSI Model	Hydrologic conditions based on resolution level, snow cover, streamflow, precipitation	USGS-Surface
Radar-derived Precipitation Totals	NWS-NEXRAD Radar Reflectivity	Radar Reflectivity	
Surface meteorological observations for agriculture	Bureau of Reclamation AgriMet Stations	Temp, Solar Radiation, Humidity, Winds, Precipitation Soil Temperature/Moisture, Pan Evaporation	DOI-Surface
Water resource systems	Bureau of Reclamation Hydromet Stations	Temperature, Precipitation Snow water equivalent, Gage height, discharge	
			USDA-Surface
Surface meteorological observations	RAWS - Remote Automated Weather Stations	Temp, Solar Radiation, Humidity, Winds, Precipitation, Soil Conditions, Fuel Moisture	
Surface meteorological observations	SCAN - Soil Climate Analysis Network	Temp, Solar Radiation, Humidity, Winds, Precipitation, Soil Conditions	
Soil conditions for fire potential assessment	Wildland Fire Assessment System	Keetch and Byram Drought Index	USDA-Model
Fire Potential	Wildland Fire Assessment System	Other Indices	
			NASA-Surface
Rainfall rate	GMAO Ocean		NASA-Model
Surface fluxes			
Vegetation Indices	GSFC GOCART		
Evapotranspiration			
Rainfall Rate			
Humidity Product	LANL POP Ocean		
Total precipitable water			
Rainfall Rate & Profile	ER-2	EDOP-ER-2 Doppler Radar	NASA-Airborne
		AMPR-Advanced Microwave Precipitation	



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Products/Services	Observing System/Model	Instrument/Parameter	Agency
		Radiometer LIP-Lightning Instrument Package HAMSR-High Alt. MMIC Sounding Radiometer	
Land Cover Classification, Total Precipitable Water, Snow Cover, Vegetation Indices, Evapotranspiration	Terra	MODIS - Moderate Resolution Imaging Spectrometer	NASA-Spaceborne
Surface Fluxes, Clouds		CERES - Clouds & Earth's Radiant Energy System	
Humidity Product	Aqua	AIRS - Atmospheric Infrared Sounder	
Rainfall Rate & Profile	TRMM	Precipitation Radar	
		Lightning Imaging Sensor	
		TRMM Microwave Imager	
	Aqua	AMSR-E-Advanced Microwave Scanning Radiometer for EOS	
Radiometric observations	Atmospheric Radiation Measurement Program (ARM) - Radar, Lidar, Radiometers	Irradiance, longwave, shortwave radiation, etc.	DOE-Surface
Surface meteorological observations	SMOS-Surface Meteorological Observing System	Temperature, humidity, precipitation, winds, pressure	
Surface energy fluxes	ECOR-Eddy Correlation Systems/PGS-Precision CO2 Mixing Ratio System/EBBR-Energy Balance Bowen Ratio	Latent, Sensible heat flux, soil heat flux, soil moisture etc.	
Rainfall Rate & Profile	DMSP F-13, F-14, F-15	SSM/I-Special Sensor Microwave Imager	DoD-Spaceborne
	DMSP F-16, F-17	SSMIS-Special Sensor Imager Sounder	
			EPA-Surface
			EPA-Models
1-meter b&w, 4-meter multi-spectral, 1-meter color, and 1 and 4-meter data bundle	IKONOS	11 bit panchromatic- 11 bit multi-spectral	Space Imaging
1-meter b&w, 4-meter multispectral, 1-meter color, and 1 and 4-meter data bundle	QuickBird	Panchromatic- Multispectral	Digital Globe

**Draft Table 2. Decision Support Systems**

Decision Support Systems	Description	Contributing Agencies
Air Quality Index (AQI)	A health based index for reporting air quality	EPA, NOAA, NASA
	Ground level ozone, particulate matter, CO, SO <sub>2</sub> , NO <sub>2</sub> , <a href="http://www.epa.gov/airnow">www.epa.gov/airnow</a>	
AIRNow	Gathers information from numerous sources to develop air quality forecasts	EPA, NOAA, NASA
CMAQ, Community Multi-Scale Air Quality modeling	Assess emissions control strategies, compliance, state plans (SIPs)	EPA, NOAA,
	Potential emissions reduction	
GOCART	Aerosol transport	NOAA,
RAQMS Regional Air Quality Modeling System		NASA
MM5	Model	
BlueSkyRAINS	Smoke trajectory and risk tool	EPA, NOAA, USFS, NASA
OMI		NASA
EP-TOMS		NASA
WRF-CHEM		NOAA, EPA, NASA
Applied Climate Information System (ACIS) <sup>1</sup>	Internet-based system designed to provide directed access for user specified queries to climate data archives. The availability of products on ACIS allows the user to conduct their own climate analyses using high quality data. ACIS is a distributed and synchronized system that provides consistent and timely climatic products.	NOAA Regional Climate Centers

<sup>1</sup> <http://www.rcc-acis.org>

## Acronym List

### A

ACCA	Automatic Cloud Cover Assessment
ADEOS	Advanced Earth Observation Satellite
AGS	Alaska Ground Station
AIRMoN	Atmospheric Integrated Research and Monitoring Network
ALOS	Advanced Land Observing Satellite
AMSR	Advanced Microwave Scanning Radiometer (satellite)
AMSU	Advanced Microwave Sounding Unit (satellite)
ANSS	Advanced National Seismic System
AQI	Air Quality Index
ASAR	Advanced Synthetic Aperture Radar (on Envisat)
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
ATBD	Algorithm Theoretical Basis Document
AU	Astronomical Unit
AVHRR	Advanced Very High Resolution Radiometer
AVIRIS	Airborne Visible-Infrared Imaging Spectrometer

### B

BRDF	Bidirectional Reflectance Distribution Function
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### C

CCD	Charge Coupled Device
CCSDS	Consultative Committee for Space Data Systems
CCSP	Climate Change Science Plan
CENR	Committee on Environment and Natural Resources
CEOS	Committee on Earth Observation Satellites
CMAQ	Community Multi-scale Air Quality model
COSPEC	Correlation Spectrometer (to detect SO <sub>2</sub> )
CPF	Calibration Parameter File
CRAM	Combined Radiometric Correction Model

### D

DART	Deep-ocean Assessment and Reporting of Tsunami
DEM	Digital Elevation Model
DFCB	Data Format Control Book
DHS	Department of Homeland Security
DIS	Data and Information System'
DMSP	Defense Meteorological Satellite Program
DoD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOQ	Digital Orthophoto Quadrangle
DOT	Department of Transportation
DRM	Data Reference Model

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**E**

ECS	EOSDIS Core System
ECV	Essential Climate Variables
EDM	Electronic Distance Measurement
EOS	Earth Observing System; Earth Observing Subcommittee
EOSAT	Earth Observation Satellite Company
EOSDIS	EOS Data and Information System
EPA	Environmental Protection Agency
EPGS	EOS Polar Ground Sites
EROS	Earth Resources Observation and Science
ERS	European Remote Sensing
ESA	European Space Agency
ET	Evapotranspiration
ETM	Enhanced Thematic Mapper (Landsat instrument)
ETM+	Enhanced Thematic Mapper Plus (Landsat instrument)
EVI	Enhanced Vegetation Index

**F**

FAC	Full Aperture Calibrator
FDF	Flight Dynamics Facility
FEAF	Federal Enterprise Architecture Framework
FGDC	Federal Geographic Data Committee
FOV	Field of View
FPAR	Fraction of Photosynthetically Active Radiation
FTP	File Transfer Protocol

**G**

GAW	Global Atmospheric Watch
GCM	General Circulation Model
GCOS	Global Climate Observing System
GEOSS	Global Earth Observation System of Systems
GEOSAT	Geodetic Satellite
GeoTIFF	Geographic Tagged Image File Format
GLOS	Global Land Observation System
GOES	Geostationary Operational Environmental Satellite
GOOS	Global Ocean Observing System
GPS	Global Positioning System
GSD	Ground Sample Distance
GSN	GCOS Surface Network
GTOS	Global Terrestrial Observing System
GUAN	GCOS Upper Air Network

**H**

HAZUS	Hazards U.S. (FEMA's Hazard and Risk Assessment software package)
HHS	Health and Human Services

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**I**

IAS	Image Assessment System
IEOS	Integrated Earth Observation System
IFOV	Instantaneous Field of View
IGBP	International Geosphere-Biosphere Programme
IGCO	Integrated Global Carbon Observation
IGOS	Integrated Global Observation System
IGS	International Ground Stations
InSAR	Interferometric Synthetic Aperture Radar
IOC	Initial On-orbit Checkout
IPCC	Intergovernmental Panel on Climate Change
IR	Infrared
IWGEO	Interagency Working Group on Earth Observations

**J**

JPL	Jet Propulsion Laboratory
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**L**

LAHARZ	Lahar Zonation (lahar run-out model)
LAI	Leaf Area Index
LGS	Landsat Ground Station
LICOR	small infrared analyser for CO <sub>2</sub> (brand name)
LIDAR	Light Detection and Ranging
LP DAAC	Land Processes Distributed Active Archive Center
LTAP	Long Term Acquisition Plan
LULCC	Land Use and Land Cover Change

**M**

MASTER	airborne ASTER sensor
ME	Memory Effect
MEASURE	Mobile Emissions Assessment System for Urban and Regional Evaluation
METEOSAT	Meteorology Satellite
MISR	Multi-angle Imaging Spectroradiometer
MMS	Multi-mission Modular Spacecraft
MOC	Mission Operations Center
MODIS	Moderate Resolution Imaging Spectroradiometer
MRLC	Multi-Resolution Land Characteristics
MSCD	Mirror Scan Correction Data
MSS	Multispectral Scanner
MTF	Modulation Transfer Function

**N**

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NALC	North American Landscape Characterization pathfinder project with land cover
NASA	National Aeronautics and Space Administration
NCEP	National Centers for Environmental Prediction
NDVI	Normalized Difference Vegetation Index
NED	National Elevation Dataset
NEIC	National Earthquake Information Center
NGA	National Geospatial-Intelligence Agency
NHD	National Hydrography Dataset
NIR	Near Infrared
NISN	NASA Integrated Services Network
NOAA	National Oceanic and Atmospheric Administration
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NSF	National Science Foundation
NTO	Near-Term Opportunities
NVEWS	National Volcano Emergency Warning System

**O**

OMI	Ozone Monitoring Instrument
OP-FTIR	Open-path Fourier Transform Infrared sensor
OSTP	Office of Science and Technology Policy

**P**

PAC	Partial Solar Calibrator
PAGER	Preliminary Assessment for Global Earthquake Response
PALSAR	Phased Array L-band Synthetic Aperture Radar
PBO	Plate Boundary Observatory (component of Earthscope)
PM	Particulate matter, in sizes less than the number of um stated, e.g., PM2.5
POES	Polar-orbiting Operational Environmental Satellites

**Q**

QA	Quality Assurance
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**R**

RADM	Regional Acid Deposition Model
RAQMS	Regional Air Quality Modeling System

**S**

SAR	Synthetic Aperture Radar
SCIGN	Southern California Integrated GPS Network
SCS	Scan Correlated Shift
SGS	Svalbard Ground Station
SLC	Scan Line Corrector
SMA	Scan Mirror Assembly
SME	Scan Mirror Electronics
SMOKE	Sparse Matrix Operator Kernel Emissions Modeling System

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SNR	Signal to Noise Ratio
SRR	Solid State Recorder
SRTM	Shuttle Radar Topography Mission
SURFRAD	Surface radiation budget network
SWIR	Short Wave Infrared

**T**

TDRS	Tracking Data and Relay Satellites
TIMS	Thermal Infrared Multispectral Scanner
TM	Thematic Mapper (Landsat instrument)
TOA	Top-of-Atmosphere
TOMS	Total Ozone Mapping Spectrometer
TRMM/PR	Tropical Rainfall Measuring Mission/Precipitation Radar

**U**

UAV	Uninhabited Aerial Vehicles
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USAF	United State Air Force
USDA	United States Department of Agriculture
USGEO	U.S. Group Earth Observations
USGS	United States Geological Survey

**V**

VAFTAD	Volcanic Ash Forecast Transport and Dispersion model
VIIRS	Visible Infrared Imager/Radiometer Suite
VNIR	Visible & Near Infrared

**W**

WFF	Wallops Flight Facility
WGS	World Geodetic System
WMO	World Meteorological Organization
WRS	Worldwide Reference System